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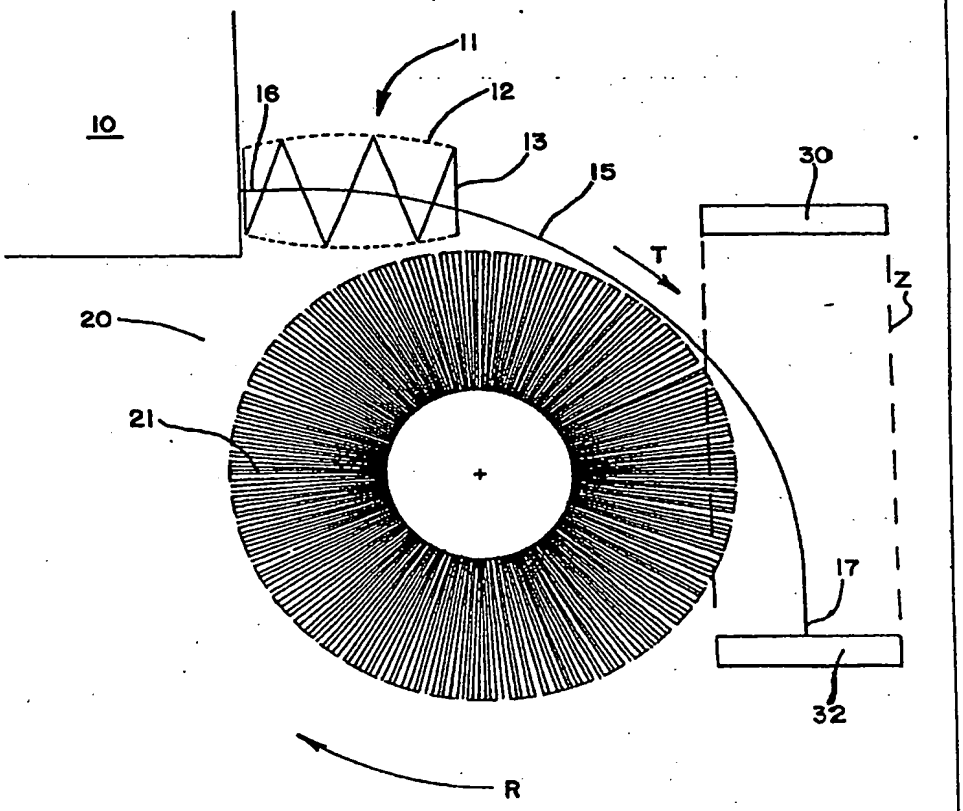
(54) Title: METHOD AND APPARATUS FOR MANUFACTURING MATTRESSES

(57) Abstract

A method and apparatus is provided which provides an improved manner in which to manufacture innerspring constructions including individual springs (11). A rotating bristled brush (20) is used to urge individual springs (11) along a path from one position to another.



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METHOD AND APPARATUS FOR MANUFACTURING MATTRESSES.

Technical Field

This invention relates in general to a method and apparatus for manufacturing mattresses or box springs. More particularly, the invention relates to a method and apparatus for transferring springs from a coiling station to a coil pocketing station, for later placement within an upholstered innerspring construction, such as a mattress or box spring.

Background of the Invention

The prior art is replete with innerspring constructions, such as mattresses or box springs, in which individual springs are formed and later combined with other elements such as border wires, wood, or upholstery, to create a mattress or box spring. An example of a box spring construction including individual springs is as shown in U.S. Patent No. 4,399,573 to *Baright*, incorporated by reference. An example of a mattress innerspring construction is illustrated in U.S. Patent No. 4,578,834 to *Stumpf*, incorporated by reference, which discloses the assembly of several steps of pocketed coils by means of "hot-melt" glue. Such pocketed coils may be created as disclosed in U.S. Patent No. 4,439,977 to *Stumpf*,

incorporated by reference, which discloses a coiler which creates individual coil springs from wire. Coils exit the coiler and are transferred by gravity and/or compressed air along a curved rod to a pocketing apparatus, which compresses relaxed springs to a relatively short height, whereupon they are inserted into fabric pockets.

Although the above-mentioned prior art methods and apparatuses include many advantages, shortcomings do exist. One such shortcoming is a limitation on speed due to the reliance on gravity and/or air pressure to transfer springs from on e position to another

Therefore, a need has been recognized for an improved method and apparatus for manufacturing springs for use in bedding, which includes a reliable and time-efficient manner in which to transfer springs from a spring manufacturing station to a spring compression station.

Summary of the Invention

Generally described, the present invention is comprised of a rotating brush which urges springs along a path defined by an arcade rod which the coils slide along. More particularly, the brush includes deflectable bristles which urge the springs along the path during rotation of the brush and maintain the springs in place once they are in a coil compression zone.

Therefore, it is an object of the present invention to provide an improved method and apparatus for manufacturing innerspring constructions such as mattresses or box springs.

It is a further object of the present invention to provide an improved method and apparatus for manufacturing springs for use in bedding.

It is a further object of the present invention to provide a time-efficient manner in which to transfer springs from a spring manufacturing station to a spring compression station.

It is a further object of the present invention to provide a method and apparatus for transferring a spring along an arcuate path.

It is a further object of the present invention to provide a method and apparatus for transferring spring along an arcuate path, such that the spring does not tend to reverse its travel along said path.

It is a further object of the present invention to provide a method and apparatus for transferring a coil spring along an arcuate path, such that the spring does not tend to come frictionally engaged or "hung" along its path.

It is a further object of the present invention to provide a method and apparatus for transferring a spring along a path at a rapid pace.

It is a further object of the present invention to provide a method and apparatus for transferring springs along a path which is cost-effective in operation.

It is a further object of the present invention to provide a method and apparatus for transferring a spring along a path, which is simple in operation and maintenance.

Other objects, features, and advantages of the present invention will become apparent upon reading the following detailed description of the preferred embodiment of the invention when taken in conjunction with the drawing and the appended claims.

Brief Description of the Drawings

Figure 1 is a view of a spring 11 just as it is being deposited from a coiling apparatus 10, such that the spring is threaded upon the rod, which passes longitudinally through its center.

Figure 2 is a view of a spring just as it is being compressed for later insertion into pocketing fabric.

Figure 3 is a step-by-step illustration of a manufacturing process according to the present invention.

Detailed Description of the Preferred Embodiment

Referring now to the figures, in which like numerals designate like objects throughout the several views.

General Construction and Operation

Figure 1 is used to illustrate the general construction and operation of the present invention. As may be seen, a spring construction apparatus 10 is generally illustrated, which converts continuous wire fed from a roll (not shown) into individual coil springs 11 at its exit point.

After the springs are formed and cut, they are individually deposited from the exit of the spring forming apparatus 10 and "threaded" onto the leading end 16 of a curved or arcuate rod 15 having a downstream end 17. A rotatable bristled brush 20 including a plurality of radially-extending bristles 21 is positioned adjacent to the arcuate rod 15 such that the bristles 32 of the brush roll 30 extend into the path of the coils as they slidably travel along the arcuate rod 15.

As the brush rotates in a clockwise rotational direction "R" (see Fig. 1), springs 11 deposited upon the leading end 16 of the rod 15 are urged by the bristles 21 of the rotating brush 20 along an arcuate path "T" similar in shape to the arcuate rod 15, such that the springs eventually stop at the downstream end 17 of the rod 15 and are maintained in place by the bristles 21 of the brush 20 as described in detail later.

Once the springs 11 are in place as shown in Fig. 2, they may be further processed. For example, they may be compressed at a compression station including a periodically vertically movable compression head 30 and a stationary base element 32 combining to define a compression zone Z. It may

be understood that the compression head 20 defines a generally planar lower surface for contact with the springs 11, but includes a slot configured to accept the rod thickness during the compression stroke of the compression head 20.

Brush interference

For purposes of this discussion, a spring 11 as shown in Fig. 1, made out of wire 13, will be considered to define a 3-dimensional "spring volume" 12, shown in dotted line, which is shown as being barrel-shaped. The spring volume 12 will be considered to be defined by the convolutions of the wire.

As may be seen in Fig, 2, the bristles 21 of the brush 20 interfere with the spring volumes 12 after the springs exit the coiling apparatus 10, and thus provide urging forces upon the coil convolutions. This is an important feature of the invention in that this moves the springs along the arcuate rod at a rate faster than they would slide along the rod under the influence of gravity and/or air pressure alone.

As also may be seen in Fig, 2, the bristles of the brush interfere with the coil volumes 12 when the coil is in place for compression. This is an important feature of the invention in that the brush bristles tend to hold the coils in place, and also tends to prevent the springs from "bouncing back" out of the compression zone, which is a particular problem encountered in the industry.

The brush 15 is driven by a vane-type air motor (not shown) attached to a reduction box (not shown), such that the brush rotates about a substantially horizontal rotational axis at a speed approximating 60-80 RPM, although this speed may be varied. However, it should be noted that it is preferred that the compressed air drives the tips of the brush bristles at a speed faster than the spring would be traveling under the influence of gravity and/or air pressure. Therefore it may be understood that the brush tends to provide an urging force by

means of the bristles to cause the spring to travel at a rate faster than it would under its own weight.

As may be seen, the path of the springs conforms somewhat to the outer diameter to the brush roll bristles. However, it may be understood that other positions of the brush roll are likewise contemplated under this invention, with other such positions being above or beside the arcuate rod. It is not necessary that the rod be arcuate or curved; a brush or a plurality of brushes could be used in conjunction with a straight rod to push springs thereon.

Timing

The brush 20 may rotate continuously, but it has been found preferable to rotate the brush periodically, in order to save air needed to drive the vanes of its propelling motor. A preferable periodic operation of the brush has been found to be to initiate brush rotation (typically by opening an air valve) simultaneously or approximately simultaneously with the cut-off and resulting release of the springs 11 from the spring forming apparatus 10. After the springs are so released, they are then picked up by the brush bristles and urged thereby to the position shown in Fig. 2. At approximately the time the springs come in contact with the stationary base element 32, air driving the brush is then shut off. The brush tends to come to a stop and is not easily movable due to friction and the presence of the speed reducer. At this point, the brush bristles, although stationary, tend to maintain the springs in place by a type of spring action due to the deflectability of the brush bristles. This is an important part of the invention in that spring "bounce back" is reduced or prevented, which is disadvantageous in that the springs may bounce out of the compression zone Z.

Composition

The bristles of the brush roll in the preferred embodiment are composed of tampico, although other materials may be used, such as metal wire or synthetic material. Bristle diameter is approximately 0.030", although other sizes may be used. One preferred brush is 1/2" wide and 10 inches in outer diameter. One preferred air motor/reducer is that made by GAST and distributed by GRANGER under the model# 4Z 412.

Overall System Operation

Referring now to Figure 3, a manufacturing process according to the present invention is disclosed. A coiling apparatus 10 makes individual springs from wire and transfers these springs (by assistance of the brush 20) to a compression and pocketing stations 50, which pockets the coils into a continuous length of pocketed coils which are cut into a preferably uniform lengths by a cut-off apparatus 60. The lengths or strips of pocketed coils are laid side-by-side and adhere together by an assembler 70 to create innerspring constructions. Upper and lower peripheral border wires are added as known in the art. The innerspring constructions are then upholstered at station 80, to create finished mattresses. Apparatuses 10 and 50 which may be used are disclosed in U.S. Patent No. 4,439,977, incorporated by reference. An apparatus such as 60 is disclosed in U.S. Patent No. 4,491,491, incorporated by reference. An apparatus such as 70 is shown in U.S. Patent No. 4,566,926, incorporated by reference.

Conclusion

Therefore, it may be seen that the present invention provides an improved method and apparatus for providing coil springs within innerspring constructions, such as by providing improved transfer between a spring forming station and a spring compression station.

While this invention has been described in specific detail with reference to the disclosed embodiments, it will be understood that many variations and modifications may be effected within the spirit and scope of the invention as described in the appended claims.

Claims

What is claimed is:

1. A method for constructing mattress innerspring constructions, comprising the steps of :

a) forming a wire spring at a spring forming station;

b) depositing said spring from said spring forming station onto a guide rod having a first end approximate said spring forming station and a second distal end approximate a spring compression station such that said guide rod passes through the center hole of said spring;

c) urging said spring along said rod to a compression location by use of a rotating brush proximate said rod having deflectable bristles contacting said spring;

d) compressing said spring when in said compression location;

e) inserting said spring into pocketing fabric to create a string of pocketed coils;

f) incorporating said pocketed coil string into a mattress innerspring construction.

2. The method as claimed in Claim 1, wherein in step "c", said coils are urged down by deflected bristle contact during at least a portion of the time they are in said compression location.

3. The method as claimed in Claim 2, wherein said arcuate rod curves in the general direction as the outer diameter of said rotating brush adjacent said rod.

4. The method as claimed in Claim 3, wherein said brush is stopped from rotation during at least a portion of said compression step "d".

5. The method as claimed in Claim 4, wherein said brush starts rotating from a stop after said spring forming step "a".

6. The method as claimed in Claim 5, wherein rotating brush includes deflectable bristles comprised of tampico.

7. The method as claimed in Claim 6, further comprising step "g", being a step of upholstering said mattress innerspring construction to create an upholstered mattress.

8. The method as claimed in Claim 1, wherein said arcuate rod curves in the general direction as the outer diameter of said rotating brush adjacent said rod.

9. The method as claimed in Claim 8, wherein said brush is stopped from rotation during at least a portion of said compression step "d".

10. The method as claimed in Claim 9, wherein said brush starts rotating from a stop after said spring forming step "a".

11. The method as claimed in Claim 1, wherein said brush is stopped from rotation during at least a portion of said compression step "d".

12. The method as claimed in Claim 11, wherein said brush starts rotating from a stop after said spring forming step "a".

13. A method for transferring springs from a first location to a second location, comprising the steps of:

a) depositing said spring onto a guide rod at said first location such that said rod passes through the center hole of said spring;

b) urging said spring along said rod to said second location by use of a rotating brush proximate said rod having deflectable bristles contacting said spring.

14. The method as claimed in Claim 13, wherein said arcuate rod curves in the general direction as the outer diameter of said rotating brush adjacent said rod.

15. The method as claimed in Claim 14, wherein rotating brush includes deflectable bristles comprised of tampico.

16. The method as claimed in Claim 13, wherein rotating brush includes deflectable bristles comprised of tampico.

17. An apparatus for transferring springs from a first location to a second location, comprising:

a) a guide rod configured to accept a spring deposited thereon such that said rod passes through the center hole of said spring; and

b) a rotating brush having deflectable bristles for urging said spring along said rod to said second location by said deflectable bristles contacting said spring.

18. The apparatus as claimed in Claim 17, wherein said arcuate rod curves in the general direction as the outer diameter of said rotating brush adjacent said rod.

19. The apparatus as claimed in Claim 18, wherein rotating brush includes deflectable bristles comprised of tampico.

20. The apparatus as claimed in Claim 13, wherein rotating brush includes deflectable bristles comprised of tampico.

FIG. 1

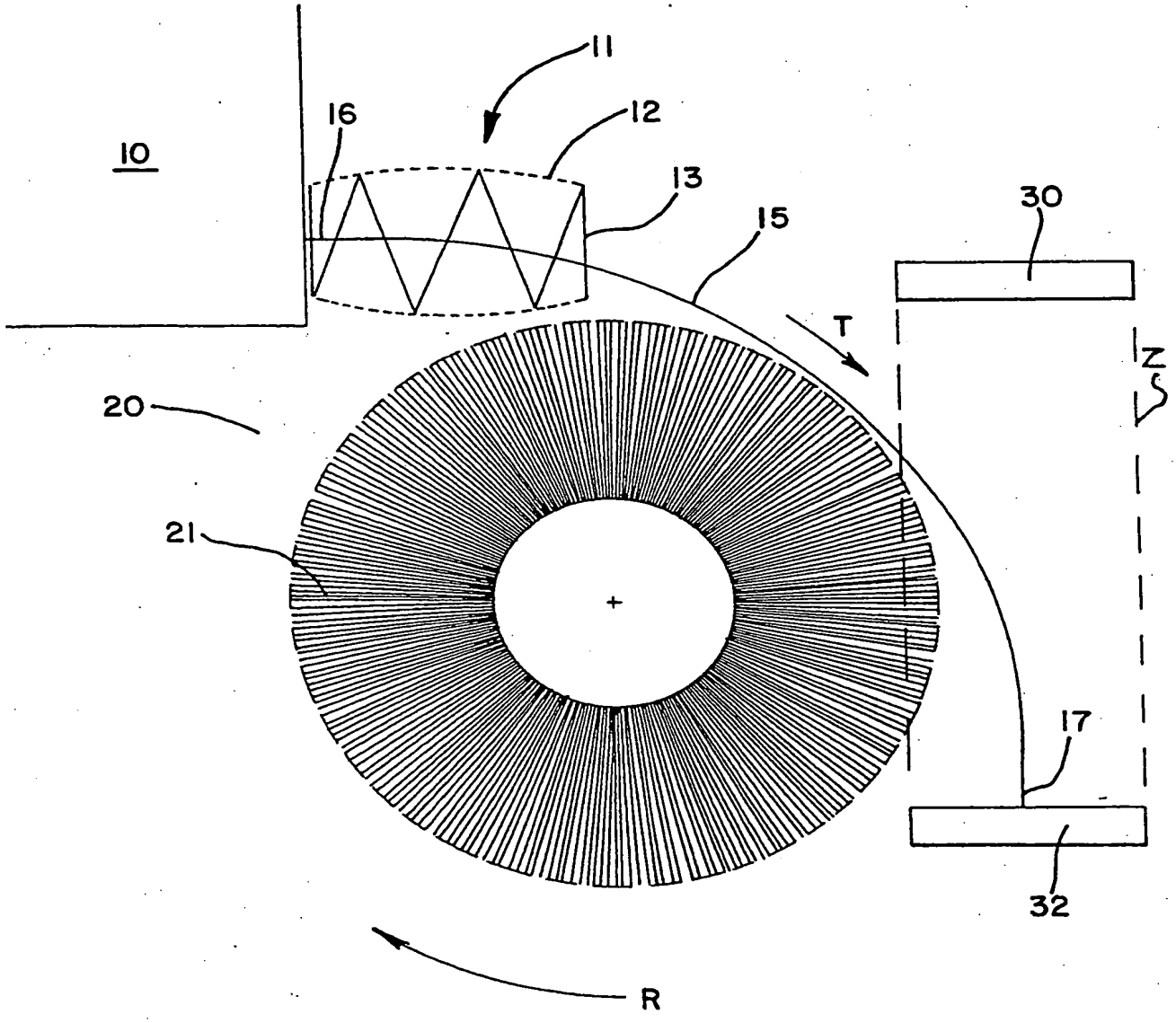
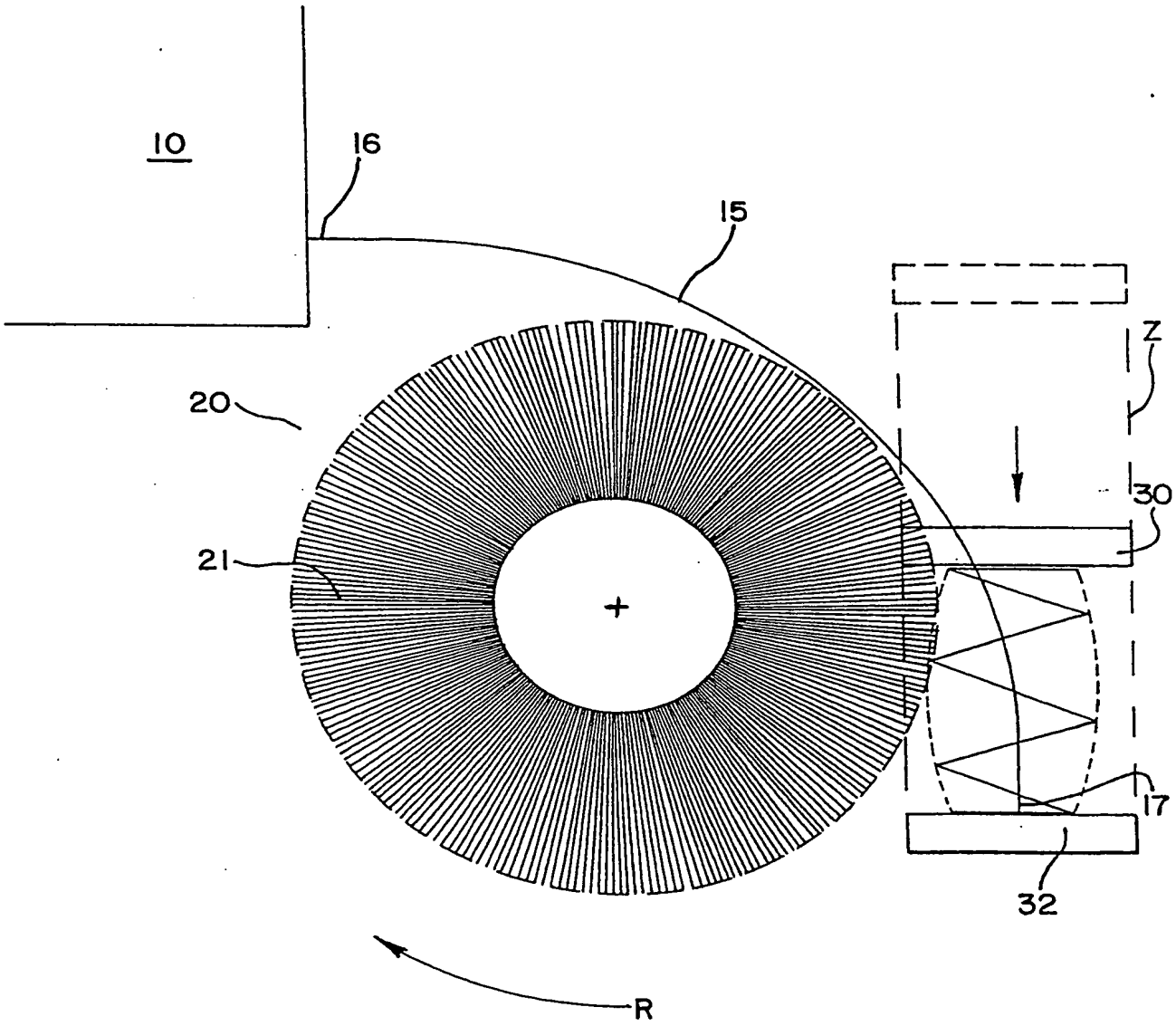


FIG. 2



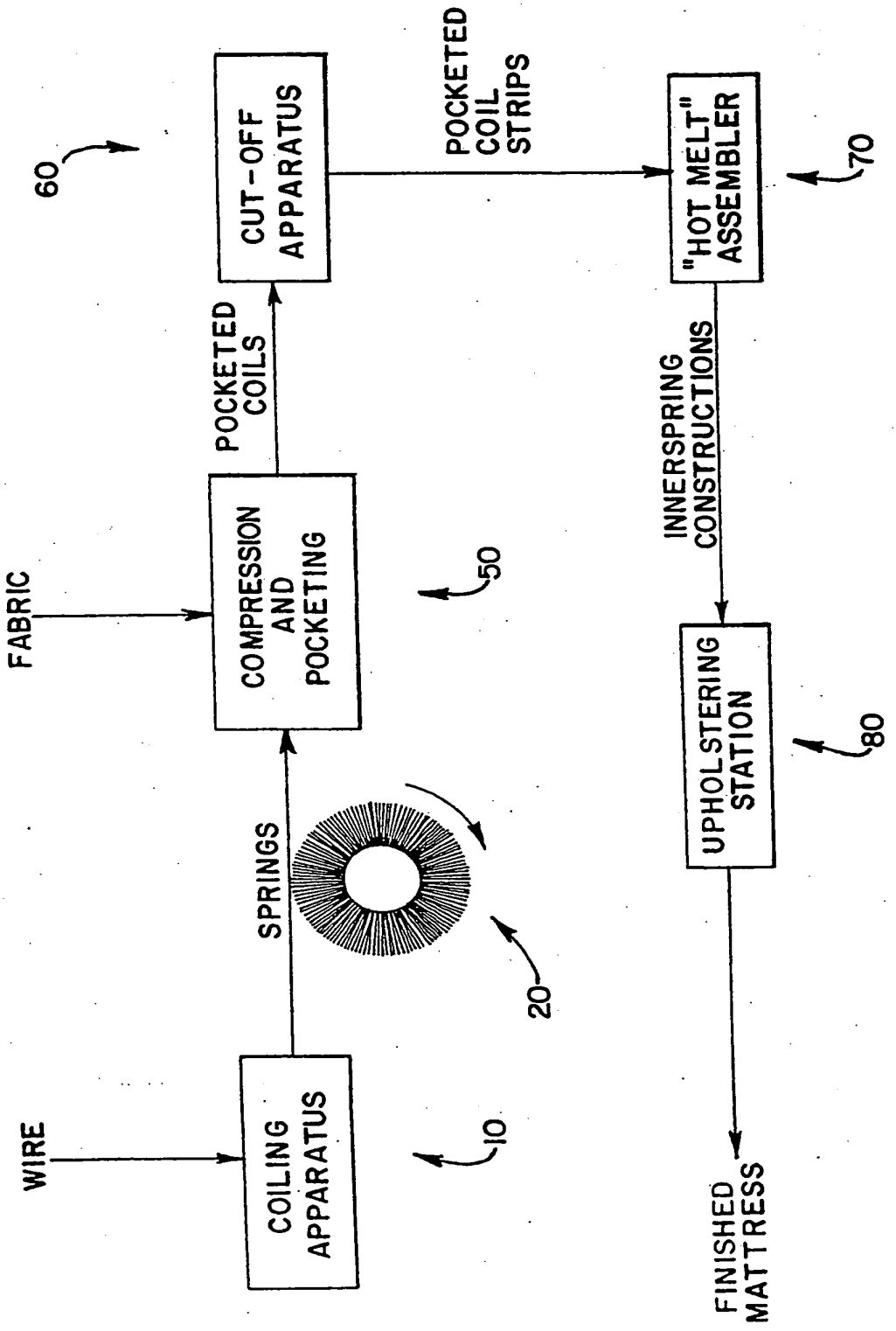


FIG.3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US94/14996

A. CLASSIFICATION OF SUBJECT MATTER
IPC(6) :B68G 7/00; B65G 35/00
US CL :29/91.1; 198/953,723
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
U.S. : 29/793,786,756,771,91.1,173,430; 5/477,475; 198/953,723

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
NONE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US, A, 5,101,955 (MASTERTON) 07 APRIL 1992 SEE ENTIRE DOCUMENT.	17-20
Y	US, A, 3,613,868 (RICKERD) 19 OCTOBER 1971 SEE ENTIRE DOCUMENT.	17-20
Y	US, A, 531,079 (WALKER ET AL) 18 DECEMBER 1894 SEE ENTIRE DOCUMENT.	17-20
Y	US, A, 4,920,638 (METZINGER) 01 MAY 1990 SEE ENTIRE DOCUMENT.	17-20
A	US, A, 4,854,023 (STUMPF) 08 AUGUST 1989 SEE ENTIRE DOCUMENT.	1-16
A	US, A, 4,986,518 (STUMPF) 22 JANUARY 1991 SEE ENTIRE DOCUMENT.	1-16

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

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International application No.
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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US, A, 4,578,834 (STUMPF) 01 APRIL 1986 SEE ENTIRE DOCUMENT.	1-16
A	US, A, 4,401,501 (STUMPF) 30 AUGUST 1983 SEE ENTIRE DOCUMENT.	1-16
A	US, A, 4,439,977 (STUMPF) 03 APRIL 1984 SEE ENTIRE DOCUMENT.	1-16
A	US, A, 4,566,926 (STUMPF) 28 JANUARY 1986	1-16
A	US, A, 1,466,617 (FOSTER) 28 AUGUST 1923	1-16